

DETAILED DESCRIPTION

Underlying Knowledge Forming Basis of the Present Disclosure

[0034] The present inventors found problems associated with a power storage system that controls multiple storage battery units. The problems will be described below specifically.

[0035] There has been proposed in recent years a technology that charges and discharges multiple storage battery units connected in series while equalizing the remaining capacities of the storage battery units and thus equalizes the loads on the storage battery units. This technology is called cell balancing or module balancing. Owing to this technology, the capacities of the storage battery units connected in series are effectively used when charging and discharging them. Also, it is expected that the equalization of the loads will suppress the local degradation of the storage battery units.

[0036] However, the equalization of the loads does not necessarily suppress the local degradation. For example, some of the storage battery units may easily degrade due to the connection form, layout, or the like of the storage battery units. In this case, the storage battery units may degrade locally even when charged or discharged equally.

[0037] For this reason, even the cell balancing or module balancing technology may not have the effect of extending the life of multiple storage battery units.

[0038] In view of the foregoing, a system of a first aspect of the present disclosure includes a first circuit in which storage battery units are connected in series, second circuits connected in parallel with the storage battery units, adjusters that adjust the amounts of currents flowing through the second circuits, and a controller that performs at least one of first control and second control. If the controller performs the first control and the second control, the controller performs the first control and the second control in different times. For example, the controller performs the first control before or after the second control. The first control is control in which during a charge of the storage battery units through the first circuit, the controller causes the adjusters to make a voltage of a first storage battery unit of the storage battery units higher than a voltage of a second storage battery unit of the storage battery units by adjusting the amounts of the currents flowing through the second circuits, the second storage battery unit having a higher degree of degradation than the degree of degradation of the first storage battery unit, and then stops the charge. The second control is control in which during a discharge of the storage battery units through the first circuit, the controller causes the adjusters to make the voltage of the first storage battery unit lower than the voltage of the second storage battery unit by adjusting the amounts of the currents flowing through the second circuits, and then stops the discharge.

[0039] Thus, the degradation of the storage battery unit having the higher degree of degradation is suppressed compared to the storage battery unit having the lower degree of degradation. As a result, the system can suppress the local degradation of the storage battery units and can extend the life of the entire storage battery units. That is, the system can appropriately control the storage battery units. The storage battery units may be any of unit cells, battery blocks including multiple unit cells, and battery modules including multiple battery blocks.

[0040] A system of a second aspect of the present disclosure may be the following: in the system of the first aspect, for example, the second circuits are circuits through which currents bypassing the storage battery units flow during the charge of the storage battery units through the first circuit, and in the first control, the controller causes the adjusters to make the voltage of the first storage battery unit higher than the voltage of the second storage battery unit by making the current flowing through the second circuit connected in parallel with the first storage battery unit smaller than the current flowing through the second circuit connected in parallel with the second storage battery unit, and then stops the charge.

[0041] This results in the suppression of the charge of the storage battery unit having the higher degree of degradation and thus the suppression of the degradation of this storage battery unit, thereby suppressing local degradation.

[0042] A system of a third aspect of the present disclosure may be the following: in the system of the first aspect, for example, the second circuits are circuits through which discharge currents of the storage battery units flow during the charge of the storage battery units through the first circuit, and in the first control, the controller causes the adjusters to make the voltage of the first storage battery unit higher than the voltage of the second storage battery unit by making the current flowing through the second circuit disposed in parallel with the first storage battery unit smaller than the current flowing through the second circuit disposed in parallel with the second storage battery unit, and then stops the charge.

[0043] Thus, the storage battery unit having the higher degree of degradation is controlled so that it is not fully charged, and the degradation thereof is suppressed. As a result, local degradation is suppressed.

[0044] A system of a fourth aspect of the present disclosure may be the following: in the system of the third aspect, for example, at least either before starting the charge of the storage battery units through the first circuit or during a suspension of the charge, the controller causes the adjusters to make the voltage of the first storage battery unit higher than the voltage of the second storage battery unit by making the current flowing through the second circuit connected in parallel with the first storage battery unit lower than the current flowing through the second circuit connected in parallel with the second storage battery unit.

[0045] Thus, a discharge is performed at an appropriate timing, and the storage battery unit having the higher degree of degradation is controlled so that it is not fully charged.

[0046] A system of a fifth aspect of the present disclosure may be the following: in the power storage system of the first aspect, for example, the second circuits are circuits through which currents bypassing the storage battery units flow during the discharge of the storage battery units through the first circuit, and in the second control, the controller causes the adjusters to make the voltage of the first storage battery unit lower than the voltage of the second storage battery unit by making the current flowing through the second circuit disposed in parallel with the first storage battery unit smaller than the current flowing through the second circuit disposed in parallel with the second storage battery unit, and then stops the discharge.

[0047] This results in the suppression of the discharge of the storage battery unit having the higher degree of degradation.